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ABSTRACT

The Military Applicant Profile (MAP) was developed to serve as an applicant screening instrument to reduce attrition in the all-volunteer Army. Since 1979, it has been used operationally to screen 17-year-old non-high school graduate males. The Army Research Institute was asked to explore the extension of MAP to older (above 17) nongraduate males, who have higher attrition rates than younger nongraduate males. Using 1976-77 data, this research evaluated the validity of MAP for education, race, and age subgroups. Results showed that MAP scores were significantly related to the 180-day stay-leave attrition criterion. Neither race (black/white) nor age interacted with the MAP-attrition relationship; education level did. The function relating MAP scores to attrition for graduates was significantly below that for nongraduates. MAP would appear to have great utility in reducing the much-higher attrition rate of nongraduates. These findings require verification, to be accomplished by research currently in progress. (Author/KC)

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Technical Report 567

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VALIDITY OF THE MILITARY APPLICANT PROFILE (MAP) FOR PREDICTING EARLY ATTRITION IN DIFFERENT EDUCATIONAL, AGE, AND RACIAL GROUPS

Newell K. Eaton, Mary Weltin, Hilda Wing

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L. NEALE COSBY
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The Military Applicant Profile (MAP) was developed to serve as an applicant screening instrument to reduce attrition. Since 1979, it has been used operationally to screen 17 year old non high school graduate males. The Army Research Institute (ARI) was asked to explore the extension of MAP to older (above 17) non graduate males, who have higher attrition rates than younger non graduate males. Using 1976-77 data, this research evaluated the validity of MAP for education, race, and age subgroups. Results showed

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Newell K. Eaton, Mary Weltin, Hilda Wing

Submitted by:
Newell K. Eaton, Chief
SELECTION & CLASSIFICATION TECHNICAL AREA

Joyce L. Shields, Director
MANPOWER AND PERSONNEL
RESEARCH LABORATORY

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333

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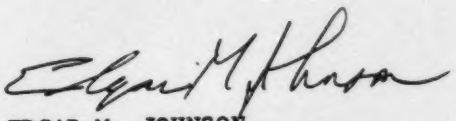
FOREWORD

The high cost of attrition in the all volunteer force led to the development in all military services of attrition screening instruments. The Army's Military Applicant Profile (MAP), based on more than twenty years of research, has been used since July 1979 to screen 17-year-old male non high school graduates. The attrition rate of this group is now equivalent to that of (unscreened) 18-20-year-old male nongraduates.

The question arose as to whether MAP would be effective for older applicants as well. In answering the question of MAP validity for different ages, the influence of education level was also explored. The results show that MAP is an effective predictor of attrition for nongraduates of all ages and races, but that it is less effective for predicting attrition of high school graduates.



EDGAR M. JOHNSON
Technical Director

VALIDITY OF THE MILITARY APPLICANT PROFILE (MAP) FOR PREDICTING EARLY ATTRITION IN DIFFERENT EDUCATIONAL, AGE, AND RACIAL SUBGROUPS

EXECUTIVE SUMMARY

Requirement:

The purpose of this research was to determine the extent to which MAP is a valid screening device for attrition for older male non-high-school-graduate applicants for Army service. The MAP is currently used to screen 17-year-old male nongraduates.

Procedure:

The 1976-77 recruit data base provided the only available data across age, education, and race groups. Chi-square analyses (two-way and multivariate) were used to evaluate the effects of MAP and three demographic variables (education, age, and race) on attrition (six-month stay-leave).

Findings:

MAP scores predicted attrition equally well for all age groups and both graduates and nongraduates. The lower overall attrition rate for graduates minimizes the utility for reducing attrition with this group. Its use for any age group of nongraduate males of either race is supported by these data and analyses.

Utilization of Findings:

This report was prepared for the use by the Army in determining how MAP should be used as a screening device for nongraduate male applicants.

VALIDITY OF THE MILITARY APPLICANT PROFILE (MAP) FOR PREDICTING EARLY ATTRITION IN DIFFERENT EDUCATIONAL, AGE, AND RACIAL SUBGROUPS

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INTRODUCTION[1]

Attrition refers to a soldier's leaving active duty prior to the expected completion of his or her contractual tour of duty; such attrition is a serious problem for the Army. By the time a soldier has completed advanced individual training the Army has invested an estimated $10,000 in recruiting, training and support costs (McConnell & McNichols, 1979). The individual has invested several months of his/her life as well. Efforts to preserve these investments have a long history in military behavioral research (Flag, 1964; Bell, Bolin & Houston, 1974; Bell & Holz, 1975; Bell & Houston, 1976).

Cognitive ability tests such as the Armed Services Vocational Aptitude Battery (ASVAB) are not generally predictive of motivational attrition but biographical questionnaires have been more successful. The self-description technique has been adapted to a wide variety of military screening and selection topics for prediction of job performance as well as for attrition. One such instrument is the Military Applicant Profile (MAP), an autobiographical information questionnaire comprised of 60 items relating to the respondent's family, academic and work experience, athletic/physical competence, self-concept, and social style/participation. MAP was developed from Army Research Institute (ARI) research in military delinquency dating back to the Korean War (Carleton, Burke, Klieger & Drucker, 1957; Johnson & Kotula, 1958).

Initially, weights were assigned to certain items of biographic information. These were combined with aptitude test results to yield a "whole person" score. The higher the score, the better the predicted chances for adjustment and completing Initial Entry Training. The biographic information was age, education, and record of prior civil court conviction (Seeley, 1978). In the next research step, a personal history questionnaire was added to the MAP. The Early Experience Questionnaire (EEQ) inquired about prior civilian activities such as community and extra-curricular school activities, participation in sports, reasons for dropping out of school, personal activities and civilian job experience (Bell, Kristiansen & Seeley, 1974). At this point in the development of a suitable screening device, the decision was made by the Army to emphasize the prediction of attrition among the highest risk group, the high school non graduate. Items most predictive of attrition in non graduates were collected and formed the basis of the current MAP, Forms 4A and 4B. MAP has been used operationally since July, 1979 to screen 17 year old male high school non graduates. Such selection appears to have reduced attrition for this group from 20% to 14% at the six-month point of service (Erwin, 1982).

Because of the MAP's recent success with the younger male non graduate group, expanding its use to older applicants had been proposed previously. A report upon which to base a policy decision was required during 1982. The purpose of this paper was to evaluate whether the prediction of attrition from MAP scores was confounded by education, race or age variables. The earlier research conducted during the developmental stages of MAP (Erwin & Herring, 1977; Frank &

[1]The assistance of Frances Grafton and Betty Teevan in completing many of these analyses was invaluable. Further, John Mellinger, Larry Hanser, and Joyce Shields provided many useful comments and suggestions in shaping the data analyses and interpretation. Finally, Dean Ball provided countless drafts of these pages exhibiting extraordinary persistence and adaptability. The assistance of each of these contributors is gratefully acknowledged.

Erwin, 1978) did not completely address these specific comparisons. A more recent, more extensive data collection using new and existing forms of MAP has been initiated. However, attrition data for this group had not become available at the time of this report. Consequently, the data compiled by Erwin & Herring in 1976-77 from Army recruits were reanalyzed to address the present concerns about age, education, and race effects on prediction of attrition, and provide a report in 1982.

The use of any selection procedure should provide benefits which exceed the costs of operation. Expectancy tables typically display the benefits of a given personnel procedure by incorporating false negative rates. For example, the estimated savings attributable to using MAP as a selection procedure for 17 year old male non graduates between July, 1979, through September, 1981, are over sixteen million dollars. The costs of testing all members of this group with MAP and or recruiting additional applicants to replace those screened out by MAP need to be subtracted from the estimated savings to produce the net gain (or loss) of using MAP. While the latter costs are not known with precision, it is probably true that they are less than the estimated savings.

METHOD

Subjects and Procedure

The subjects were 4,282 male Army enlistees to whom MAP instruments were administered between November, 1976, and February, 1977, and for whom attrition data were available. MAP data were collected at Reception Stations after soldiers had enlisted in the Army and were used for research purposes only, not to select or screen enlistees in any way. Attrition data reflected whether the soldiers were still in the Army 180 days after entering active duty, or had left for "failure to adapt" reasons. Reasons such as lack of motivation, failure to meet physical standards (non medical), and discharges for marginal performance were considered relevant. Soldiers who were discharged for medical, hardship, or related reasons were excluded from the sample. Subjects were classified into subgroups for the age and education analyses. Those who had earned high school diplomas were considered graduates (n=1999); those who had not were considered nongraduates (n=2279). Those who had earned General Equivalency Diplomas (GED) were considered nongraduates, consistent with current Army policy. For four individuals, education status was not known. Subjects were grouped into four age groups (17-year-olds, 18-year-olds, 19-20-year olds, and those 21 and older) and into one of two race groups, blacks (n=1105) and whites (n=2816). There were 357 who were classified as Hispanic (235), other (105), or unknown.

Multivariate Analyses

Multivariate chi-square analyses were used to evaluate the extent to which the relationship between attrition rate and MAP score differed as a function of education level, age, and race. The multivariate chi-square analyses used log-linear estimation of expected frequencies, and provided results which yield, for nominal dependent variable data such as attrition/non attrition, results allowing interpretation of main effects and interactions of independent variables like those possible with analysis of variance (ANOVA). A significant χ^2 for attrition x MAP score is somewhat analogous to a significant ANOVA main effect of MAP, while a significant attrition x MAP x education χ^2 is somewhat

analogous to a significant ANOVA interaction of MAP score with education. A detailed discussion of the analysis technique and the limitations of interpretation of its results can be found in the BMDP manual (1981).

Attrition/Exclusion Tables

To address the impact on attrition of using MAP, tables were prepared to provide attrition rate and exclusion rate information as a function of possible MAP cut scores. Cut scores were defined as scores below which an individual would be excluded from service. Exclusion rate was defined as the percent of people who would be excluded with MAP scores below a particular cut score, while attrition rate was defined as the percent of people who would not be excluded by a particular cut score but who would attrite. The tables were prepared using actual data from the 4279 male enlistees in the sample.

RESULTS

Of the 4,278 enlistees in the sample, 621 (14.5%) had left the Army prior to completing 180 days service for failure to adapt. A frequency table was developed, showing attrition rate as a function of MAP score, for all the soldiers in the sample. These data are illustrated in Figure 1, which clearly shows the strong relationship between attrition rate and MAP scores (χ^2 =317., df=6, p<.001).

Multivariate chi-square analyses were used to evaluate the extent to which the relationship of attrition rate and MAP score differed as a function of education, age, and race. Although the total sample size appeared to be large, analyses using more than three variables at a time resulted in unacceptably low cell frequencies, with consequent uninterpretable results. For example, for the graduates, there are 73 seventeen-year-olds, 537 eighteen-year-olds, 793 nineteen and twenty-year olds, and 596 subjects aged 21 or older. For the non graduates, there were 933 seventeen-year-olds, 565 eighteen-year-olds, 482 nineteen and twenty-year-olds and 299 subjects aged 21 or older. Race subgroups of 1105 blacks and 2816 whites became very small when further divided by education, age, and attrition variables. This prevented the execution of a complete "factorial" analysis. Consequently, analyses were executed in logical order, evaluating the contingencies between attrition, MAP, and one other variable only. First, the attrition x MAP x education analysis was conducted, yielding both a strong attrition x MAP relationship (χ^2 =1994, df=3, p<.001), a strong attrition x education relationship (χ^2 =56.4 , df = 1, p<.001), and a nonsignificant attrition x MAP x education relationship (χ^2 = 1.4 , df=3, p>.100). The strong attrition x education relationship indicated that for soldiers with the same MAP score, a different attrition rate would be expected for graduates and non graduates. Therefore, graduates and non graduates would have to be treated separately in any use of MAP in personnel decisions based on predicted attrition. The relationship between attrition rate and MAP score is shown in Figure 2 for graduates and non graduates separately. So few graduates scored in the 30-39 point range on MAP that the empirical relationship between MAP score and attrition has been drawn to begin at the 40-49 point interval for graduates.

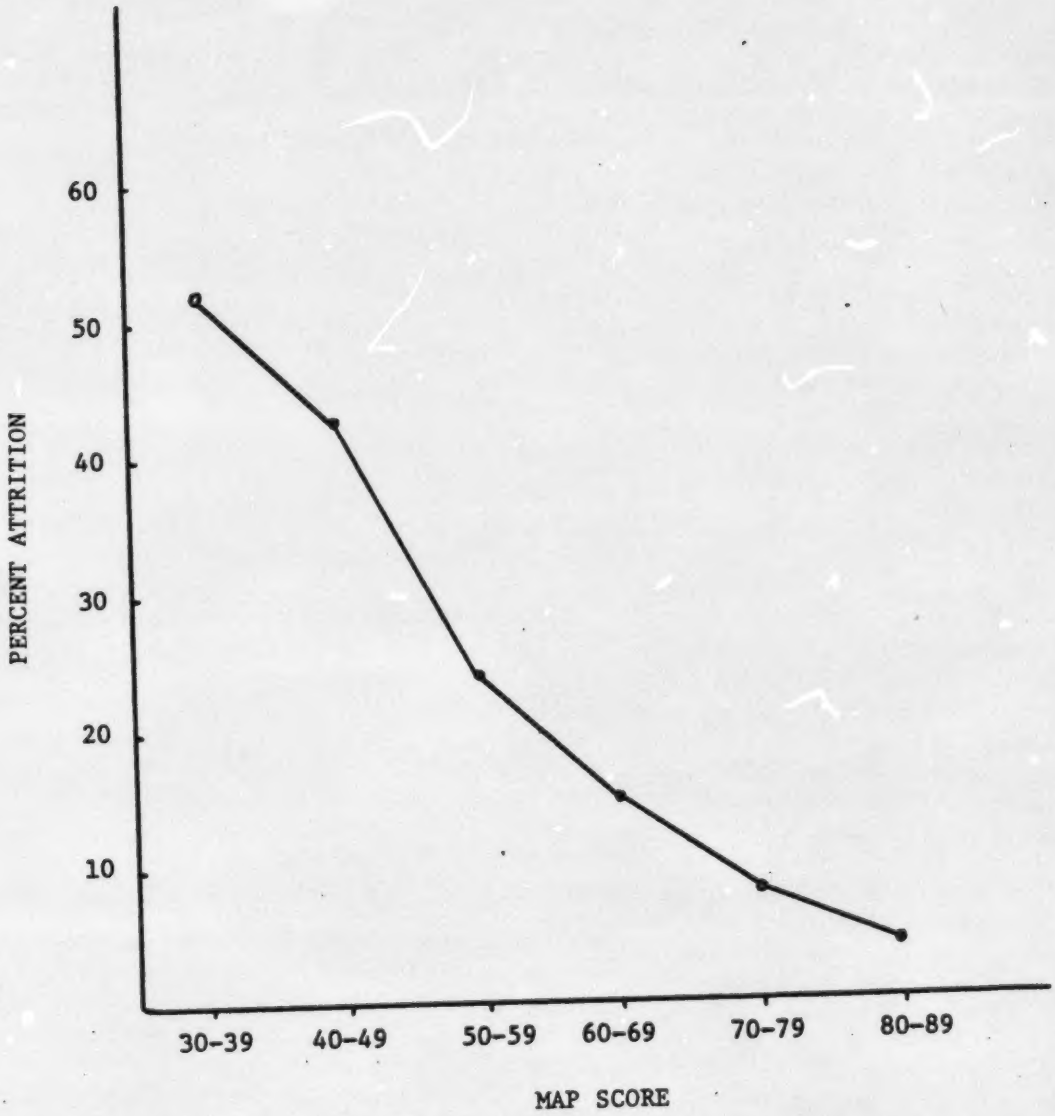

Figure 1. Percent attrition as a function of MAP score for total 1976-77 enlistee sample.

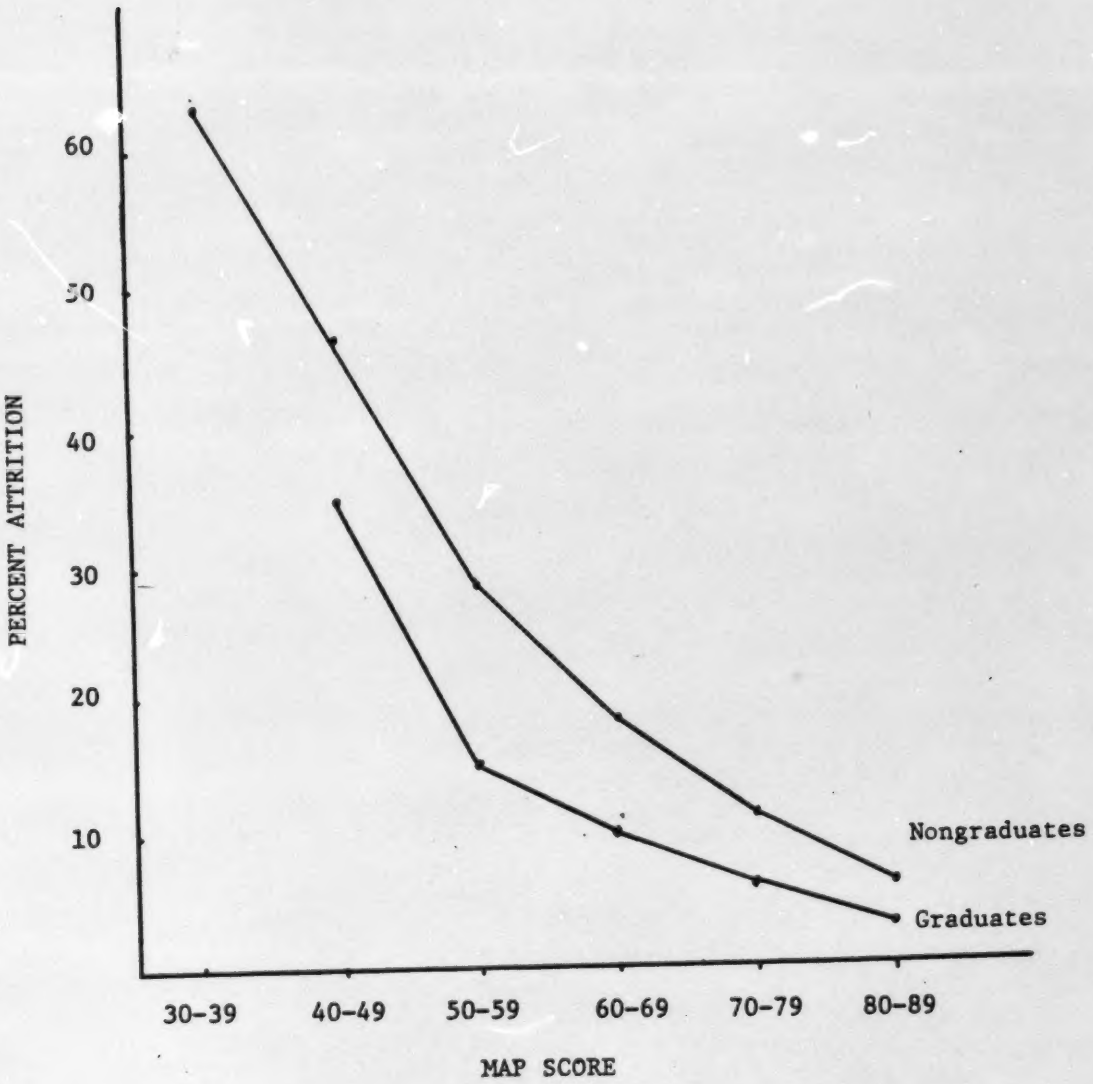

Figure 2. Percent attrition as a function of MAP score separately for high school graduates and nongraduates, for 1976-77 enlistee sample.

Because of the differential impact of education, separate analyses were used to examine attrition x MAP x race relationships for graduates (N=1999) and non graduates (N=2280). For graduates the attrition x MAP relationship was significant (χ^2=33.48, df=3, p<.001), but the attrition x race, and attrition x race x MAP relationships were not (χ^2's = 2.47 and 1.78, df's=1 and 3, p's>.100, respectively). A parallel analysis for non graduate data yielded a much larger, significant attrition x MAP relationship (χ^2 = 138.60, df=3, p<.001) and nonsignificant attrition x race and attrition x race x MAP relationships (χ^2=.39 and 1.94, df's = 1 and 3, p's>.100). These analyses showed that while there was a significant relationship between MAP scores and attrition rate, for graduates and for non graduates, there was no significant effect of race on either education subgroup.

Last, attrition x MAP x age analyses were conducted to determine whether the attrition x MAP relationships differed by age group. Analyses were again conducted separately for graduates and non graduates. The analysis for graduates yielded a significant attrition x MAP relationship (χ^2=38.95, df=3, p<.001) and nonsignificant relationships for attrition x age, and for attrition x age x MAP (χ^2's=5.15 and 13.49, df's=3 and 9, p's>.100, respectively). The same relationships were found with the analysis of non graduate data. The attrition x MAP relation was significant (χ^2=163.79, df=3, p<.001) while attrition x age and attrition x age x MAP were not (χ^2's=4.53 and 5.24, df's =3 and 9, p's>.100.) Because sample sizes differed slightly between analyses using the different sets of three variables, slightly different χ^2 were produced. For example, for graduates χ^2 =38.95 for the attrition x MAP relationship in the attrition x MAP x age analysis, but χ^2=33.48 for the same attrition x MAP relationship in the attrition x MAP x race analysis.

Attrition/Exclusion Tables

The purpose of this section is to address the potential impact on attrition rates expected with the use of MAP. Previous analyses showed that MAP scores were significantly related to attrition rate and that the attrition levels associated with MAP scores differed significantly for graduates and non graduates, necessitating separate treatment of MAP scores for graduates and non graduates. Neither the race nor the age variable moderated the attrition x MAP relationships for either educational group.

While these findings demonstrated the relationships between MAP and attrition, they provided no direct information about how policymakers could use a MAP score to reduce attrition. Table 1 was prepared to demonstrate the expected attrition and exclusion rates for graduates and non graduates at specified MAP scores. For example, if a cutscore of 58 were set for non graduates, then 21% of these applicants would be excluded. Attrition rates for those who were accepted would be 15%. Seen from a different perspective, if one wished to reduce attrition to 15% for non graduates, then the table would show that a MAP cut score of 58 would be needed, and an exclusion rate of 21% would result. Observation of the values in the table suggests that while marked shifts in attrition rate can result from changes in MAP cut scores for non graduates, there would be little impact for graduates.

Table 1

Exclusion and Attrition Rates as a Function of
Military Applicant Profile (MAP) 4B Cut Score
for Male Enlistees, by High School Graduation Status
1976-1977 Sample

	Graduates		Non Graduates	
MAP 4B Cut Score	Excl Rate	Att Rate	Excl Rate	Att Rate
85	98	5	100	0
80	89	4	97	6
78	81	4	93	9
76	71	4	88	10
74	63	4	81	10
72	51	4	73	10
70	42	6	65	11
68	33	6	56	12
66	26	6	46	13
64	20	6	37	14
62	15	7	31	14
60	12	7	25	14
58	8	7	21	15
56	7	7	17	16
54	5	8	13	16
52	4	8	10	17
50	3	8	8	17
45	1	8	4	18
40	1	8	2	19
35	0	8	2	19
30	0	8	1	20
n	1999	169	2279	452

DISCUSSION

The analyses presented were designed to address the applicability of MAP to various educational, age, and racial subgroups of the initial MAP validation sample, and to evaluate possible cut scores for those subgroups. Initial analyses illustrated the strong relationship of MAP scores to attrition for the overall group. The second set of analyses showed that MAP scores, and hence attrition, were a function of high school graduation status. Further, MAP x attrition relationships did not differ significantly across age or race when the two education groups were considered separately. Consequently, MAP appeared to be a valid and appropriate predictor of attrition rate for both race groups and all four age groups when graduates and non graduates were evaluated separately. The third set of analyses provided distributions from which to make decisions about MAP cut scores for use in attenuating attrition. A table was provided to indicate the relationship between cut score, exclusion rate, and attrition rate selected. For example, for non graduates, if an attrition rate of 13% of those selected were desired, a cut score of 66 would be required while 46% of those tested would be excluded. If a higher attrition rate of 15% were acceptable, a cut score of 58 would be used, yielding an exclusion rate of 21% in this non graduate sample.

Several cautions are required in interpreting these data. First, these data were collected in a research context. Motivations, perceptions, or procedures may be different in an operational environment, causing unknown shifts in distributions of exclusion and attrition rates. A lower exclusion rate than that shown is known to exist for the 17 year old non graduates for whom MAP is currently in operational use. Second, these data are five to six years old. Today's youth, farther from the Viet Nam era and in a different economic climate, may respond somewhat differently, with different MAP-attrition relationships. Third, today's youth entering the Army are likely to have somewhat different demographic characteristics from enlistees in 1976-77. Fourth, while the overall sample is large, the sizes of the subgroups are not. This could yield variations between those distributions shown and the actual population distributions. Fifth, it was with these data that the operational MAP keys were developed and hence the validity may be somewhat inflated due to chance factors. Any application of this key to a different group is likely to have somewhat reduced validity.

These 1976-77 data show that attrition rates as a function of MAP scores of male Army applicants are quite different for high school graduates and non graduates, but are essentially the same for different race and age groups. Based on these data, the 1979 policy decision to require minimal MAP scores from 17 year-old non graduates was technically sound. Further, the data indicate the requirement may properly be extended to additional ages of the non graduate group. Given the low attrition rate for graduates, use of MAP for these personnel appears to be unwarranted.

Using these data as a basis for a policy decision to extend the operational requirement of MAP to different ages of non graduates should be carefully monitored. Verification based on the 1982 data collection is required. The reports of these data will be available in late 1983.

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